

MPE/iX

HP StorageWorks Disk Array XP operating system configuration guide

XP48
XP128
XP512
XP1024
XP12000

fifth edition (November 2004)

part number: A5951-96143

This guide describes the requirements and procedures for connecting the XP family of disk arrays to an HP e3000 system and configuring the disk array for operation with MPE/iX.



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HP StorageWorks Disk Array XP Operating System Configuration Guide: MPE/iX

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About this guide

This guide describes the requirements and procedures for connecting the XP family of disk arrays to an HP e3000 system and configuring the disk array for operation with the MPE/iX operating system.

Intended audience

This guide is intended for system managers who have knowledge of:

- Data processing concepts
- Direct access storage device subsystems and their basic functions
- Disk arrays
- Operating system commands and utilities

Disk arrays

Unless otherwise noted, the term *disk array* refers to these disk arrays:

HP Surestore Disk Array XP512
HP Surestore Disk Array XP48
HP StorageWorks Disk Array XP128
HP StorageWorks Disk Array XP1024
HP StorageWorks XP12000 Disk Array

Related documentation

HP provides these related documents:

- *HP StorageWorks Disk Array XP128: Owner's Guide*
- *HP StorageWorks Disk Array XP1024: Owner's Guide*
- *HP StorageWorks XP12000 Disk Array: Owner's Guide*

Refer to the HP website (<http://docs.hp.com/mpeix/all/#Fibre%20Channel>) for the following HP e3000 MPE/iX system documentation:

- *HP e3000 MPE/iX System Software Maintenance Manual* (Release C.70.00 or Release C.75.00) [30216-90317 or 30216-90344]
- *HP e3000 Fibre Channel Mass Storage Adapters Service and User Manual* [32650-90910]
- “Fibre Channel Device and Adapter Support on HP e3000 Systems” in the *Communicator e3000 MPE/iX Release 7.5 manual* (Software Release C.75.00) [30216-90336]
- *SCSI-Fibre Channel Router Installation and User Guide* [Document Number 310-605846]

The following papers located at the HP e3000 “Jazz” documentation website can be very helpful for installing XP Disk Arrays on the HP e3000. Installation is described for both the Native Fibre Channel interface and the SCSI-FC Fabric Router:

- “A Guide to Success with the A5814A-003 SCSI-FC Router”
http://jazz.external.hp.com/mpeha/papers/router_paper01.htm
- “MPE Native Fibre Channel Installation onto an FC LDEV 1”
http://jazz.external.hp.com/mpeha/howto/fc_ldev_one.html

HP storage website

Visit the support website for the most current information about HP StorageWorks XP products.

<http://h18006.www1.hp.com/storage/arraysystems.html>

For information about product availability, configuration, and connectivity, consult your HP account representative.

Conventions

This guide uses these text conventions.

Figure 1	Blue text represents a cross-reference. In the online version of this guide, the reference is linked to the target.
<u>www.hp.com</u>	Underlined, blue text represents a website on the Internet. In the online version of this guide, the reference is linked to the target.
literal	Bold text represents application names, file names, menu items, dialog box titles, buttons, key names, field names, and literal values that you type exactly as shown.
<i>variable</i>	Italic type indicates that you must supply a value. Italic type is also used for manual titles.
<code>input/output</code>	Monospace font denotes user input and system responses, such as output and messages.
<i>Example</i>	The word “example” in italics denotes an example of input or output.
[]	Square brackets indicate an optional parameter.
{ }	Braces indicate that you must specify at least one of the listed options.
	A vertical bar separates alternatives in a list of options.

HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

<http://h18006.www1.hp.com/storage/arraysystems.html>

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP authorized reseller

For the name of your nearest HP authorized reseller, call:

United States 1-800-345-1518

Canada 1-800-263-5868

Or contact: www.hp.com

Revision history

September 1999	Open-8 emulation added.
January 15, 2000	Content revised and reorganized.
June 1, 2000	Added support for XP512.
February 1, 2001	Added support for XP48 and SCSI-to-Fibre Channel router.
June 2003	Changed brand name from Surestore to StorageWorks. Added support for XP1024 and XP128.
November 2003	Minor update.
November 2004	Added MPE/iX Native FC extension.

Warranty statement

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Installation

You and your HP service representative each play a role in installation. Your HP service representative is responsible for installing the disk array and formatting the disk devices. You are responsible for configuring the host server for the new devices with assistance from your HP service representative.

Features and requirements

The disk array has the following features:

- **Storage capacity.** The storage capacity for each model is listed below:
 - XP48:** Up to 48 drives from 72 GB to 8.7 TB, 24 FC ports
 - XP128:** From 8 to 128 drives for up to 18 TB, 48 FC ports
 - XP512:** Up to 512 drives from 72 GB to 93 TB, 48 FC ports
 - XP1024:** From 8 to 1024 drives for up to 149 TB, 64 FC ports
 - XP12000:** Up to 1152 drives for up to 165 TB, 128 FC ports
 - Disks:** 18 GB 15,000 RPM; 36 GB 10,000 RPM; 73 GB 10,000 RPM; 181 GB 7,200 RPM
- **Server support.** HP e3000: A-Class, N-Class, Series 9x8, Series 9x9, and Series 99x
- **Operating system support.** MPE/iX Operating System, Release 7.0 Express 1 with patch MPEMX36, or Release 7.5

Before installing the disk array, ensure the environment conforms to these requirements:

- Fibre Channel host adapters (for A-Class and N-Class only) or HVD SCSI adapters (for Series 9x8, Series 9x9, and Series 99x system models). Refer to the adapter documentation for installation. Use of SCSI adapters also requires SCSI-FC Fabric Routers as described later in this document.
- *(Recommended)* HP StorageWorks Command View XP with LUN management feature or Remote Control with the LUN Configuration Manager XP option. These are used to configure disk array ports and paths.
- *(Recommended)* HP StorageWorks Secure Manager XP. Allows the host to access only authorized array devices.
- *(Optional)* Other available XP software (some may not be supported by your system):

- HP StorageWorks Business Copy XP
- HP StorageWorks Continuous Access XP
- HP StorageWorks Continuous Access Extension
- HP StorageWorks RAID Manager XP

Fibre Channel interface

The MPE/iX host can use the A7895A 2 Gbps Fibre Channel HBA to connect to the disk array. The disk array port should not use auto negotiate to detect the speed of the host Fibre Channel adapter. Configure it "hard" to either 1 or 2 Gbps.

Even though the interface is Fibre Channel, this guide uses the term “SCSI disk” because disk array devices are defined to the host as SCSI disks.

SCSI-FC Fabric Router

The HP e3000 supports the A5814A-003 SCSI-FC Fabric Router hardware, which enables an HP e3000 with HVD SCSI HBAs to connect to a disk array with a Fibre Channel interface. The router converts data between the SCSI I/O interface at the host server and the Fibre Channel I/O interface at the disk array.

Device types

The HP e3000 system supports only OPEN-x device types. LUSE and CVS device types are not supported.

Failover

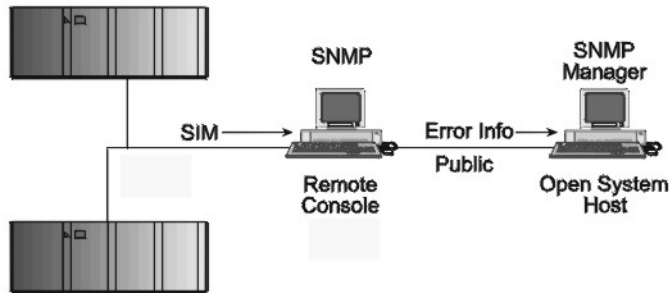
The HP e3000 system supports I/O path failover for the disk arrays by means of the MPE/iX High Availability FailOver/iX software product.

SNMP configuration

The XP family of disk arrays supports standard Simple Network Management Protocol (SNMP) to remotely manage the disk array from the host. The SNMP agent on the remote console PC or Command View can provide status and Remote Service Information Message (R-SIM) reporting to the SNMP manager on the host for up to eight disk arrays.

Command View does not execute on the HP e3000 and must be executed on another supported platform (such as Windows or HP-UX).

Refer to the operating system documentation to configure the SNMP manager on the host.



RAID Manager command devices

RAID Manager manages Business Copy (BC) or Continuous Access (CA) operations from a host server. To use RAID Manager with BC or CA, use Command View or LUN Configuration Manager to designate at least one disk array LDEV as a command device. Refer to the Command View or LUN Configuration Manager user guide for information about how to designate a command device.

Caution *An LDEV designated as a command device cannot contain any MPE/iX files or data. Create a single member volume set through the VOLUTIL utility program. Then VSCLOSE it, SCRATCHVOL it, and convert it to a command device.*

Installation procedures

Perform these actions to install and configure the disk array:

1. [Install and configure the disk array \(page 18\)](#)
 - Setting the Host Mode for the disk array ports
 - Setting the System Option Modes
 - Configuring the Fibre Channel ports
2. [Install the host hardware \(page 21\)](#)
 - Installing the host system
 - Installing and configuring the HBAs
 - Fabric zoning and LUN security
 - Multiple operating systems in a shared switch fabric
3. [Connect the disk array \(page 24\)](#)
 - Determining the paths
 - Storage capacity per path
4. [Load the OS software \(page 27\)](#)
5. [Configure the disk array devices in MPE/iX \(page 28\)](#)
 - Configuring with native Fibre Channel disk array attachment
 - Configuring with SCSI-FC fabric router disk array attachment
6. [Create volume sets and volumes \(page 36\)](#)

Install and configure the disk array

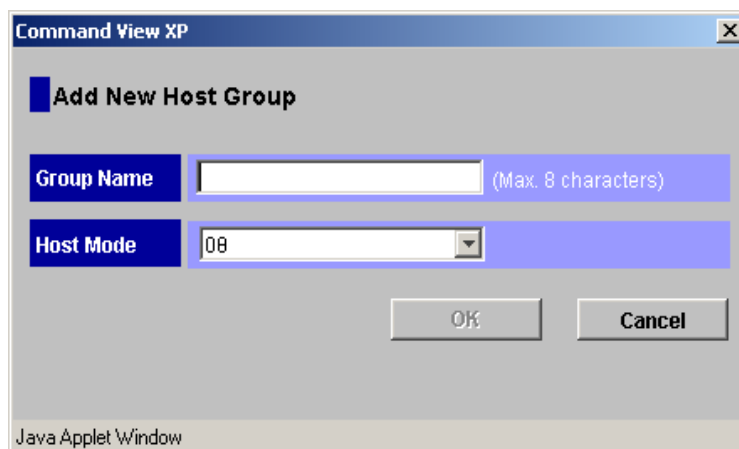
The HP service representative performs these tasks:

- Assembling hardware and installing software
- Loading the microcode updates
- Installing the channel adapters (CHAs) and cabling
- Installing and formatting devices

After these tasks are finished, you will use Command View or LUN Configuration Manager to complete the tasks listed below. If you do not have Command View or LUN Configuration Manager, your HP service representative can perform these tasks for you.

Setting the Host Mode for the disk array ports

The disk array ports have Host Modes that you must set depending on the host you use. After the disk array is installed, use Command View (shown) or LUN Configuration Manager to set the Host Mode for each port.



The host mode setting for MPE/ix is **08**.

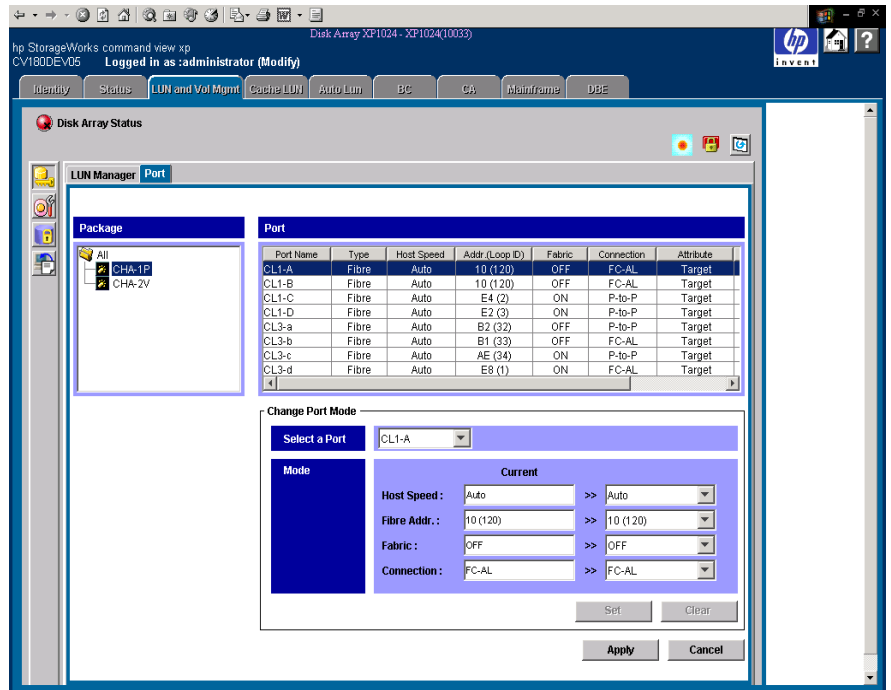
Setting the System Option Modes

The HP service representative sets the System Option Mode(s) based on the operating system and software configuration of the host.

Configuring the Fibre Channel ports

Configure the Fibre Channel ports on the disk array using Command View (shown) or the Fibre Parameter window in LUN Configuration Manager.

Select the settings for each port based on your storage area network topology. Use switch zoning if you connect different types of hosts to the array through the same switch..

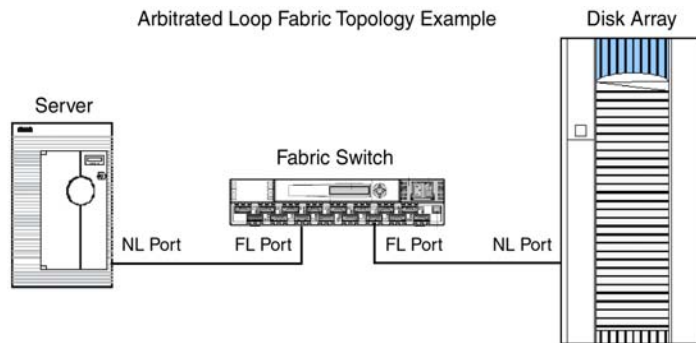


Fibre address

In fabric environments, the port addresses are assigned automatically. In arbitrated loop environments, set the port addresses by selecting a unique arbitrated loop physical address (AL-PA) or loop ID for each port.

Fabric and connection parameter settings

For HP e3000 systems, set the port topology to FABRIC ON and the connection parameter to FC-AL. This provides an NL-port on the disk array (public arbitrated loop) and is the recommended supported topology.



Install the host hardware

This section explains how to install and configure the host and host bus adapters (HBAs) that connect the host to the disk array.

If you plan to use Fibre Channel switches to create a SAN environment, install them according to the manufacturer's instructions.

If you plan to connect to the disk arrays using HP e3000 SCSI HBAs (HVD required), install the required A5814A-003 SCSI-FC Fabric Routers according to the instructions in the SCSI-Fibre Channel Router Installation and User Guide.

When you are configuring the fabric switch for use with routers, make sure that you configure initiator zoning. (See Jazz article “A guide to Success with the A5814A-003 SCSI-FC Router,” referenced on [page 6](#).)

Installing the host system

Install the host system following the HP e3000 system installation instructions.

Installing and configuring the HBAs

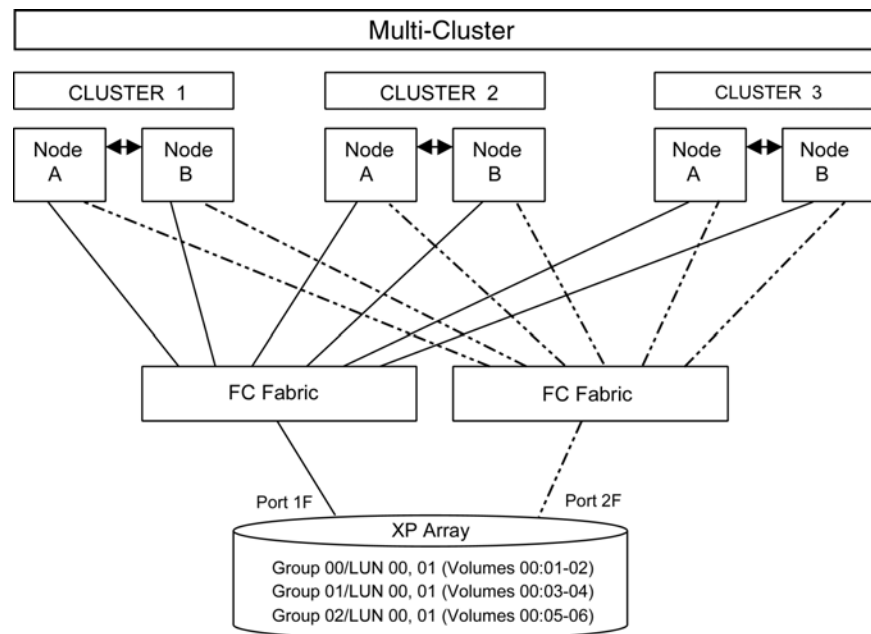
Install and configure the host bus adapter cards using the HP HBA installation instructions, driver software, and setup utilities.

When you are installing A6795A Fibre Channel HBAs on A-Class and N-Class systems, be sure to record the I/O slot paths where you install the cards. You will need the I/O paths of these HBAs later during the I/O configuration procedure. For SCSI HBA installations, recording the I/O paths is not required. You can determine those I/O later using the MAPPER/MAPPER2 facility.

Fabric zoning and LUN security

If you plan to use clustering, install and configure the clustering software on the servers.

Clustering is the organization of multiple servers into groups. Within a cluster, each server is a node. Multiple clusters compose a multi-cluster environment. The following example shows a multi-cluster environment with three clusters, each containing two nodes. The nodes share access to the disk array.



Within the Storage Area Network (SAN), the clusters may be homogeneous (all the same operating system) or they may be heterogeneous (mixed operating systems). How you configure LUN security and fabric zoning depends on the operating system mix and the SAN configuration.

Multiple operating systems in a shared switch fabric

By using appropriate zoning and LUN security, you can connect multiple clusters with multiple operating systems to the same switch and fabric.

Environment	OS Mix	Fabric Zoning	LUN Security
Standalone SAN (non-clustered)	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple hosts connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Clustered SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Multi-Cluster SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	

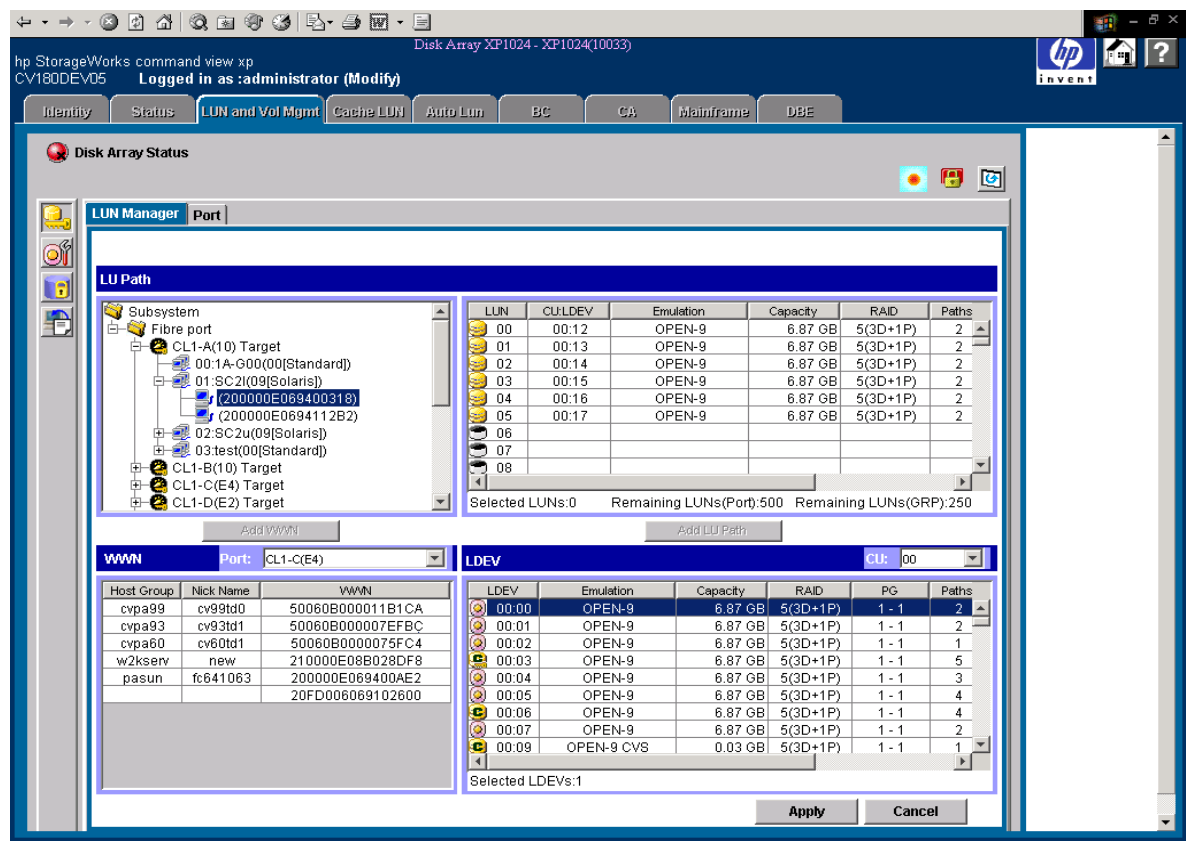
Connect the disk array

The HP service representative connects the disk array to the HP e3000 host by:

1. If connecting SCSI cables, shutting down and powering off the host.
2. Verifying operational status of the disk array channel adapters, LDEVs, and paths.
3. Connecting the I/O cables between the disk array and the host. Fibre Channel cables run from the disk array to either the host system (direct native Fibre Channel connection), a Fibre Channel switch (fabric Fibre Channel connection), or to an A5814A-003 SCSI-FC Fabric Router (host SCSI to disk array Fibre Channel connection). If you use a SCSI-FC Router, run SCSI I/O cables from the router to the host system.
4. Powering on all peripherals if they were turned off.
5. Powering on and booting up the host if it was turned off.
6. Verifying the ready status of the disk array and peripherals.

Determining the paths

Use Command View (shown) or LUN Configuration Manager to map paths between ports and volumes within the disk array. The paths (LUNs) you create provide the host access to array devices. For detailed instructions, refer to the Command View or LUN Configuration Manager user guide. Write down the LUNs for later use in configuring or verifying the host.



Storage capacity per path

An important difference between MPE/iX and other operating systems (such as HP-UX) is the determination of disk capacity on a path. MPE/iX is very sensitive to spindle count (LUNs) per path. If this count exceeds 16 per bus or path, performance problems may result.

To determine the available storage capacity in a path, subtract required system and application I/O space from the total disk capacity and divide the result by the spindle count (number of LUNs) in the path.

If performance information isn't available, create a configuration similar to the installation you had before migrating to the XP array, but be sure not to exceed 16 LUNs per path. Exceeding this number may cause MPE/iX to issue more I/O requests than the XP array can service.

Load the OS software

For an existing host requiring an OS update before installing the array, follow the instructions in the HP e3000 MPE/iX System Software Maintenance Manual to install or to update the OS.

The OS must be MPE/iX 7.0 or MPE/iX 7.5.

If you are installing a new MPE/iX OS onto an XP disk array that will serve as the boot disk (MPE/iX Ldev 1), refer to Appendix C. The appendix provides for instructions on obtaining the required *primary boot path* of that disk array device. Setting the primary boot path into the processor's PDC memory is a required first step for OS software installation.

If, however, you are installing or updating an OS *not using a newly connected XP disk array as Ldev 1*, determine the primary boot path by the normal HP e3000 methods (for example, ODE> run MAPPER or MAPPER2 or by using fcscan).

Configure the disk array devices in MPE/iX

Use either the SYSGEN utility program or the IOCONFIG utility command to perform I/O configuration of the new XP disk array devices for the MPE/iX OS.

The SYSGEN utility allows you to prepare a new I/O configuration for the system, but the new configuration does not take effect until the system is rebooted.

The IOCONFIG command prepares a new I/O configuration and puts it into effect immediately, while the system is up, without a reboot.

Both configuration utilities execute in the normal MPE/iX system environment while the system is up and running. Therefore you must boot and start the OS from the MPE/iX Ldev 1 boot disk before you can perform configuration.

For a pre-existing system to which new XP disk array devices are being added, you will already have an operable system on an existing Ldev 1 boot disk that you can start up. For a newly installed system, boot the system from the primary boot path just used to install the system, and start the OS using the appropriate factory configuration group, as described in the System Software Maintenance Manual.

Regardless of which configuration utility you choose, you must determine the system I/O paths of the XP disk array devices' internal LUNs in order to add those devices to the system I/O configuration.

The procedure to determine the I/O paths depends on the I/O interface attachment method for your system:

- Native Fibre Channel (A-Class and N-Class systems running MPE/iX 7.5)

OR

- SCSI-FC Fabric Router (available for all systems).

Follow the procedure below that applies to your system:

- "Configuring with native Fibre Channel disk array attachment" [\(page 29\)](#)
- "Configuring with SCSI-FC fabric router disk array attachment" [\(page 32\)](#)

Configuring with native Fibre Channel disk array attachment

For native Fibre Channel attachment of disk arrays, MPE/iX Release 7.5 provides the new **fcscan** utility which is capable of determining the I/O paths (both in SYSGEN and in PDC formats) for the disk arrays. Before **fcscan** can do this, the I/O paths of the Fibre Channel HBAs must first be configured in MPE/iX, using either SYSGEN or IOCONFIG.

This is the overall procedure for configuring disk arrays with Fibre Channel attachment:

- Boot and start the system.
- Use SYSGEN or IOCONFIG to configure the I/O paths of the Fibre Channel HBAs. (Your recorded these I/O paths when you installed the HBAs into the system.)
- Use **fcscan -h** to determine the I/O paths for the disk arrays' N-ports and LUNs. Using **fcscan** also verifies disk array device recognition.
- Use SYSGEN or IOCONFIG to I/O configure the disk arrays' N-ports and LUNs.

After completing the I/O configuration procedure, create MPE/iX volume sets and disk volumes on the configured XP disk array devices.

The following sample I/O configuration procedure uses IOCONFIG to perform immediate I/O configuration and **fcscan -h** to determine device paths for native Fibre Channel attachment of XP disk arrays. In this example there are two XP disk arrays, each routed through a SAN FC switch, and then each attached to an A6795A Fibre Channel HBA on the server host. The procedure begins after the system has been booted and started, and for brevity only two LUNs within each XP disk array are shown being configured by IOCONFIG.

Further detailed information about determining I/O paths for Fibre Channel disk arrays can be found in the *HP e3000 Fibre Channel Mass Storage Adapters Service and User Manual*, and in the MPE/iX Release 7.5 *Communicator* article “Fibre Channel Device and Adapter Support on HP e3000 Systems.”

1. With the system booted up, use IOCONFIG to configure the I/O paths for the Fibre Channel HBAs (located at paths 0/4/0/0 and 0/6/0/0 in this example):

```
CSYLE18<PUB.SYS>:ioconfig
IOCONFIG A.00.00 (catalog A.00.00) (c) 1994 Hewlett-Packard Co. All Rights Reserved MON,
AUG 23, 2004, 5:29 PM
ioconfig:apath path=0/4; id=pat_pci_bc
ioconfig:apath path=0/6; id=pat_pci_bc
ioconfig:apath path=0/4/0; id=pci_device
ioconfig:apath path=0/6/0; id=pci_device
ioconfig:apath path=0/4/0/0; id=a6795a
td: claimed Tachyon XL2 Fibre Channel Mass Storage card at 0/4/0/0
Scanning for fibre channel devices at 0/4/0/0. This may take a while...
ioconfig:apath path=0/6/0/0; id=a6795a
td: claimed Tachyon XL2 Fibre Channel Mass Storage card at 0/6/0/0
Scanning for fibre channel devices at 0/6/0/0. This may take a while...
ioconfig:exit
keeping to group CONFIG.SYS
Purge old configuration (yes/no)?Automatic yes
** configuration files successfully saved **
CSYLE18<PUB.SYS>:
```

2. Use **fcscan -h** to determine the SYSGEN I/O paths for the disk arrays that are attached through HBAs at 0/4/0/0 and 0/6/0/0:

```
CSYLE18<PUB.SYS>:fcscan -h
```

```
FCSCAN Version 1.1
```

```
Scanning for Fibre Channel devices.
This could take upto few minutes. Please wait ...
```

```
FCSCAN has found the following Fibre Channel I/O Adapter Cards and Devices on this
system.
```

SYSGEN PATH	DESCRIPTION	BOOT MENU PATH
=====	=====	=====
0/4/0/0	Fibre Channel Adapter	
0/4/0/0.70962	Fibre Channel N-Port	
0/4/0/0.70962.0	HP OPEN-3 disk	0/4/0/0.1.21.50.0.0.0
0/4/0/0.70962.1	HP OPEN-3 disk	0/4/0/0.1.21.50.0.0.1
0/4/0/0.70962.2	HP OPEN-3 disk	0/4/0/0.1.21.50.0.0.2
0/6/0/0	Fibre Channel Adapter	
0/6/0/0.70962	Fibre Channel N-Port	
0/6/0/0.70962.0	HP OPEN-3 disk	0/6/0/0.1.21.50.0.0.0
0/6/0/0.70962.1	HP OPEN-3 disk	0/6/0/0.1.21.50.0.0.1
0/6/0/0.70962.2	HP OPEN-3 disk	0/6/0/0.1.21.50.0.0.2

```
CSYLE18<PUB.SYS>:
```

3. Use IOCONFIG to I/O configure the Fibre Channel N-Ports and the XP disk array LUNs as MPE/iX Ldevs:

```
CSYLE18<PUB.SYS>:ioconfig
IOCONFIG A.00.00 (catalog A.00.00) (c) 1994 Hewlett-Packard Co. All Rights Reserved  MON,
AUG 23, 2004,  5:38 PM

ioconfig:apath path=0/4/0/0.70962; id=fc_nport
ioconfig:adev ldev=100; path=0/4/0/0.70962.0; id=hpdarray
Class(es) updated, so rerun asoctbl.pub.sys to recreate asociate.pub.sys.

BEGIN VOLUME MOUNTING ON LDEV 100 (AVR 9)
UNKNOWN VOLUME MOUNTED ON LDEV 100 (AVR 15)

ioconfig:adev ldev=101; path=0/4/0/0.70962.1; id=hpdarray
Class(es) updated, so rerun asoctbl.pub.sys to recreate asociate.pub.sys.

BEGIN VOLUME MOUNTING ON LDEV 101 (AVR 9)
UNKNOWN VOLUME MOUNTED ON LDEV 101 (AVR 15)

ioconfig:apath path=0/6/0/0.70962; id=fc_nport
ioconfig:adev ldev=200; path=0/6/0/0.70962.0; id=hpdarray
Class(es) updated, so rerun asoctbl.pub.sys to recreate asociate.pub.sys.

BEGIN VOLUME MOUNTING ON LDEV 200 (AVR 9)
UNKNOWN VOLUME MOUNTED ON LDEV 200 (AVR 15)
ioconfig:adev ldev=201; path=0/6/0/0.70962.1; id=hpdarray
Class(es) updated, so rerun asoctbl.pub.sys to recreate asociate.pub.sys.

BEGIN VOLUME MOUNTING ON LDEV 200 (AVR 9)
UNKNOWN VOLUME MOUNTED ON LDEV 200 (AVR 15)

ioconfig:exit
    keeping to group CONFIG.SYS
    Purge old configuration (yes/no)?Automatic yes
    ** configuration files successfully saved **
CSYLE18<PUB.SYS>:
```

4. Confirm with the DSTAT command and then create volume sets and volumes on the new XP disk array devices.

Configuring with SCSI-FC fabric router disk array attachment

Configure disk array devices attached through the SCSI-FC Fabric Router in the same way as for other SCSI disk devices. No special MPE/iX configuration steps are required. However, before proceeding read the guidelines in the "Jazz Router Paper" cited on [page 6](#).

Use the MAPPER (or MAPPER2 for A-Class and N-Class) I/O mapping utility program in the Offline Diagnostic Environment (ODE) to display the I/O paths for the SCSI HBAs and the disk array devices (targets and LUNs). Then use either SYSGEN or MPE/iX's IOCONFIG utility command and the I/O paths reported by MAPPER to perform the MPE/iX I/O configuration of SCSI HBAs and disk Ldevs.

To configure disk array devices attached by SCSI-FC Fabric Router:

1. Boot the system to the ISL> prompt on the primary boot path.
2. Invoke the ODE (Offline Diagnostic Environment) system from the ISL> prompt.
3. Run the MAPPER (or MAPPER2 for A- and N-Class systems) I/O mapping utility within ODE.

Running MAPPER will verify that the disk array devices are recognized by the host system. MAPPER should "see" and report the presence of all of the new SCSI HBAs and XP disk array devices.

4. Locate the I/O paths for the SCSI HBAs and disk array devices in the MAPPER output, and record the paths for later use in SYSGEN or IOCONFIG.
5. Exit the ODE system back to the ISL> prompt.
6. Start MPE/iX on the primary boot path.
7. Run either SYSGEN or IOCONFIG to perform I/O configuration of the SCSI HBAs for the disk array devices and the disk array Ldevs.
8. For SYSGEN, after saving the I/O configuration, you must shut down and restart the OS to put the new configuration into effect. For IOCONFIG, the new configuration is immediately effective without any shutdown and reboot.

9. Use the MPE/iX VOLUTIL utility to create volume sets and volumes on the new disk array devices.

A sample I/O configuration procedure for disk array devices attached by SCSI-FC Fabric Router is presented below. For brevity, this example shows only relevant excerpts from the MAPPER listing:

1. Boot on the primary boot path.

```
Main Menu: Enter command or menu > bo pri
Interact with IPL (Y, N, or Cancel)?> y

Booting...
Boot IO Dependent Code (IODC) revision 1

SOFT Booted.
MMSAVE Version 2.8
DUMPAREA found, save main memory to disc
ISL loaded

ISL Revision A.00.43  Apr 12, 2000

ISL>
```

2. Invoke ODE.

```
ISL> ode
```

3. Run MAPPER. (A/N-Class systems use MAPPER2.)

```

ODE> run mapper 2
STARTING EXECUTION OF MAPPER2

Processor Identification:
  Hardware Model: 5CBH, Revision: 0
  Software Model: 4H, Revision: 0

I/O Configuration:

```

Path	Component Name	Type ID	HW Model	SW Model	Revisions Hdw	Revisions Firm
0	Astro BC Runway Port	CH	582H	BH	0	0
0/0	Elroy PCI Bridge	DH	782H	AH	0	0
0/0/0/0	Ethernet Controller	1011H	0019H	103CH	104FH	41H
0/6	Elroy PCI Bridge	DH	782H	AH	0	0
0/6/2/0	Symbios SCSI Controller	1000H	000FH	103CH	12C0H	37H
0/6/2/0.0.0	HP OPEN-3	-	-	-	-	0118
0/6/2/0.0.1	HP OPEN-3	-	-	-	-	0118
0/6/2/0.0.2	HP OPEN-3	-	-	-	-	0118
0/6/2/0.0.3	HP OPEN-3	-	-	-	-	0118

```

Resetting the Boot Device...
Done.

Exiting...

RUN COMPLETED.
ODE>

```

4. For the newly added disk array, the SCSI HBA is at I/O path 0/6/2/0, and the disk array LUNs are at I/O paths 0/6/2/0.0.0, 0/6/2/0.0.1, 0/6/2/0.0.2, and so on.

5. Exit back to ISL> prompt.

```
ODE> exit
```

6. Start the OS on the primary boot path.

```
ISL> start norecovery group=config
```

7. Use IOCONFIG to configure the SCSI HBA and SCSI disk Ldevs.

```

CSYLE18<PUB.SYS>:ioconfig
IOCONFIG A.00.00 (catalog A.00.00) (c) 1994 Hewlett-Packard Co. All Rights Reserved
ioconfig:lp path path=0/6
PATH: *0/6
ID: PAT_PCI_BC
PMGR: PCI_ELROY_MGR
LMGR:
LDEV:
TYPE: BC
PMGRPRI: 2
MAXIOS: 0

ioconfig:lp path path=0/6/2
Warning: Path doesn't exist. (IOCONFIG 37)
ioconfig:
ioconfig:apath path=0/6/2; id=pci_device
ioconfig:apath path=0/6/2/0; id=a5159a
ioconfig:apath path=0/6/2/0.0; id=pseudo
ioconfig:adev ldev=300; path=0/6/2/0.0.0; id=hpdarray
Class(es) updated, so rerun asoctbl.pub.sys to recreate associate.pub.sys.

BEGIN VOLUME MOUNTING ON LDEV 300 (AVR 9)

```

```

UNKNOWN VOLUME MOUNTED ON LDEV 300 (AVR 15)
ioconfig:adev ldev=301; path=0/6/2/0.0.1; id=hpdarray
Class(es) updated, so rerun asoctbl.pub.sys to recreate asociate.pub.sys.

BEGIN VOLUME MOUNTING ON LDEV 301 (AVR 9)

UNKNOWN VOLUME MOUNTED ON LDEV 301 (AVR 15)
ioconfig:adev ldev=302; path=0/6/2/0.0.2; id=hpdarray
Class(es) updated, so rerun asoctbl.pub.sys to recreate asociate.pub.sys.

BEGIN VOLUME MOUNTING ON LDEV 302 (AVR 9)

UNKNOWN VOLUME MOUNTED ON LDEV 302 (AVR 15)
ioconfig:exit
    keeping to group CONFIG.SYS
    Purge old configuration (yes/no)?Automatic yes
    ** configuration files successfully saved **
CSYLE18<PUB.SYS>:

```

8. Run VOLUTIL to create volume sets and volumes as explained in the next section.

Create volume sets and volumes

After I/O configuration has been completed, create volume sets and member volumes on the disk array devices using the VOLUTIL utility in the same way that you would do these tasks for any other MPE/iX disk.

Refer to the Volume Management manual (32650-90045) and to the VOLUTIL section of the MPE/iX System Utilities Reference Manual (32650-90908) for detailed information on volume creation and management.

Troubleshooting

This section describes resolutions for various error conditions you may encounter.

If you are unable to resolve an error condition, ask your HP support representative for assistance. See [“Calling the HP support center” on page 40](#).

Error conditions

Depending on your system configuration, you may be able to view error messages as follows:

- View SIMs in Command View (Device Health tab).
- View R-SIMs in Remote Control XP, including reference codes and severity levels of recent R-SIMs.
- View SIMs that generate SNMP traps on the host.

Error Condition	Recommended Action
The logical devices are not recognized by the host.	<p>Verify that the READY indicator lights on the disk array are ON.</p> <p>Verify that fiber cables are correctly installed and firmly connected.</p> <p>Verify that the target IDs are properly configured. The LUNs for each TID must start at 0 and continue sequentially without skipping any numbers.</p> <p>Verify that the TIDs/WWNs on each bus are unique. Do not install two devices with the same ID on the same bus.</p> <p>Recheck the buses for new devices.</p> <p>Verify that the disk array Host Mode is set correctly.</p>
The host does not reboot properly after hard shutdown.	<p>If you power off the host without executing the shutdown process, wait three minutes to allow the disk array's internal timeout process to purge queued commands. If the host restarts while the disk array is processing queued commands, the host may not reboot successfully.</p>
Volumes cannot be created.	<p>Verify that the disk array logical devices are correctly formatted.</p> <p>Verify with the appropriate utility (MAPPER or fcscan) that disk array devices are recognized by the host system.</p> <p>Verify all components of the SYSGEN I/O configuration pertaining to the disk arrays.</p>

Error Condition	Recommended Action
The disk array performs a self reboot because the disk array was busy or it logged a panic message.	Reboot the host.
The disk array responds “Not Ready” or the disk array has displayed “Not Ready” and timed out.	Contact HP.
The host detects a parity error.	Check the HBA and make sure it was installed properly. Reboot the host.
The host hangs or devices are declared down and the host hangs.	Make sure there are no duplicate disk array TIDs and that disk array TIDs do not conflict with any host TIDs.

Calling the HP support center

If you are unable to resolve an error condition, contact the HP support center for assistance.

Contact Information

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

<http://h18006.www1.hp.com/storage/arraysystems.html>

Before you call

Be sure to have the following information available:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

Disk array device emulations

This appendix provides information about supported emulations and device type specifications. Some parameters may not be relevant to your array. Consult your HP representative for information about supported configurations for your system.

Supported emulations

MPE/iX systems support ONLY the OPEN-x emulations. LUSE and CVS are not supported.

XP Model	OPEN Emulation Type	OPEN Emulation Supported	LUSE	CVS	LUSE & CVS
XP256	OPEN-3	Yes			
	OPEN-8	Yes			
	OPEN-9	Yes			
	OPEN-K	Yes			
	OPEN-L	Yes			
	OPEN-M	Yes			
	OPEN-V				
XP512/48	OPEN-3	Yes			
	OPEN-8	Yes			
	OPEN-9	Yes			
	OPEN-K	Yes			
	OPEN-L	Yes			
	OPEN-M	Yes			
	OPEN-V				
XP1024/128 XP12000	OPEN-3	Yes			
	OPEN-8	Yes			
	OPEN-9	Yes			
	OPEN-K				
	OPEN-L	Yes			
	OPEN-M				
	OPEN-V	Yes			

Device type specifications

Device Type (Note 1)	Category (Note 2)	Blocks (512 bytes)	Sector Size (bytes)	# of Cylinders	Heads	Sectors per Track	Capacity MB* (Note 3)
OPEN-3	SCSI disk	4806720	512	3338	15	96	2347
OPEN-8	SCSI disk	14351040	512	9966	15	96	7007
OPEN-9	SCSI disk	14423040	512	10016	15	96	7042
OPEN-E	SCSI disk	28452960	512	19759	15	96	13893
OPEN-L	SCSI disk	71192160	512	49439	15	96	34761
OPEN-V	SCSI disk	max=125827200	512	Note 5	15	128	Note 6
LUSE							
OPEN-3*n	SCSI disk	4806720*n	512	3338*n	15	96	2347*n
OPEN-8*n	SCSI disk	14351040*n	512	9966*n	15	96	7007*n
OPEN-9*n	SCSI disk	14423040*n	512	10016*n	15	96	7042*n
OPEN-E*n	SCSI disk	28452960*n	512	19759*n	15	96	13893*n
OPEN-L*n	SCSI disk	71192160*n	512	49439*n	15	96	34761*n
OPEN-V*n	SCSI disk	max=125827200 Note 4	512	Note 5	15	128	Note 6
CVS							
OPEN-3 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
CVS LUSE							
OPEN-3*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-V*n	SCSI disk	Note 4	512	Note 5	15	128	Note 6

*Capacity = (512 x number of blocks) ÷ 1024²

Note 1: The availability of a disk type depends on the disk array.

Note 2: The devices are defined to the host as SCSI disk devices, even though the interface is Fibre Channel.

Note 3: The device capacity can sometimes be changed by the BIOS or host adapter board. This may make actual capacity different from that listed in the table.

Note 4: The number of blocks for a CVS volume is calculated as follows:
 $\# \text{ of blocks} = (\# \text{ of cylinders}) \times (\# \text{ of heads}) \times (\# \text{ of sectors per track})$

Example 1: For an OPEN-3 CVS volume with capacity = 37 MB:
 $\# \text{ of blocks} = (53 \text{ cylinders—see Note 5}) \times (15 \text{ heads}) \times (96 \text{ sectors per track}) = 76320$

Example 2: For an OPEN-V CVS volume with capacity = 49 MB:
 $\# \text{ of blocks} = (53 \text{ cylinders—see Note 5}) \times (15 \text{ heads}) \times (128 \text{ sectors per track}) = 101760$

Note 5: The number of cylinders for a CVS volume is calculated as follows
($\uparrow \dots \uparrow$ means that the value should be rounded up to the next integer):

OPEN-3/8/9/E: The number of cylinders for a CVS volume =
 $\# \text{ of cylinders} = \uparrow (\text{capacity (MB) specified by user}) \times 1024/720 \uparrow$

Example: For an OPEN-3 CVS volume with capacity = 37 MB:
 $\# \text{ of cylinders} = \uparrow 37 \times 1024/720 \uparrow = \uparrow 52.62 \uparrow$ (rounded up to next integer) = 53 cylinders

OPEN-V: The number of cylinders for a CVS volume =
 $\# \text{ of cylinders} = \uparrow (\text{capacity (MB) specified by user}) \times 16/15 \uparrow$

Example: For an OPEN-V CVS volume with capacity = 49 MB:
 $\# \text{ of cylinders} = \uparrow 49 \times 16/15 \uparrow = \uparrow 52.26 \uparrow$ (rounded up to next integer) = 53 cylinders

OPEN-3/8/9/E: The number of cylinders for a CVS LUSE volume =
 $\# \text{ of cylinders} = \uparrow (\text{capacity (MB) specified by user}) \times 1024/720 \uparrow \times n$

Example: For a CVS LUSE volume with capacity = 37 MB and $n = 4$
of cylinders = $\lceil 37 \times 1024 / 720 \rceil \times 4 = \lceil 52.62 \rceil \times 4 = 53 \times 4 = 212$

OPEN-V: The number of cylinders for a CVS LUSE volume =
of cylinders = $\lceil (\text{capacity (MB) specified by user}) \times 16 / 15 \rceil \times n$

Example: For an OPEN-V CVS LUSE volume with capacity = 49 MB and $n = 4$
of cylinders = $\lceil 49 \times 16 / 15 \rceil \times 4 = \lceil 52.26 \rceil \times 4 = 53 \times 4 = 212$

Note 6: The capacity of an OPEN-3/8/9/E CVS volume is specified in MB, not number of cylinders. The capacity of an OPEN-V CVS volume can be specified in MB or number of cylinders. You set the volume size using the LUN Configuration Manager or Command View software.

Booting from the array

In order to use a native Fibre Channel-connected disk array as MPE/iX Ldev 1 (the boot disk) to load, boot, and run the OS software, you must know the primary I/O boot path leading to the desired LUN in the XP disk array. The primary boot path must be set into PDC memory so that the processor will be able to perform I/O to the disk device during system boot operations.

You can use one of three methods to determine the primary boot path for your disk array LUN, depending on the particular situation. These methods are summarized at the start of this appendix and are explained in detail on the page referred to in the summary.

1. Existing MPE/iX 7.5 boot disk is available (page 50):

If the system already has an MPE/iX Release 7.5 OS installed on an existing disk device (internal or external SCSI disk), use the following procedure.

- Boot and run the OS from the existing Ldev 1 boot disk.
- Use the **fcscan -h** utility program for native Fibre Channel I/O path mapping. This will give you the BOOT MENU PATH for all of the native Fibre Channel attached disk array devices.
- Select the desired disk array LUN to be your new Ldev 1.
- Use the BOOT MENU PATH from **fcscan** as the primary boot path.

2. No existing MPE/iX boot disk available and disk array is direct Fibre Channel connected (page 53):

If the system does not already have an MPE/iX Release 7.5 OS installed, and the disk array you want to use for MPE/iX Ldev 1 is native Fibre Channel and directly cabled to the host HP e3000 system (no Fibre Channel switch), then use the following procedure.

- Use the MAPPER2 I/O mapping utility of the ODE (Offline Diagnostic Environment) to display the boot menu I/O paths for all of the LUNs of that disk array. MAPPER2 will correctly detect and report the paths for a direct-Fibre-Channel-connected disk array.
- Boot the system from the SLT (System Load Tape) on the alternate boot path
- Run ODE>MAPPER2.
- Select the desired disk array LUN to be your new Ldev 1, and use the I/O path reported by MAPPER2 to be the primary boot path.
- Install the OS onto the new Ldev 1.

3. No existing MPE/iX boot disk available and disk array is Fibre Channel switch connected (page 55):

If the system does not already have an MPE/iX Release 7.5 OS installed and the disk array you want to use for MPE/iX Ldev 1 is

SAN-connected (through a Fibre Channel switch) to the host HP e3000 system, then use the following procedure.

- You CANNOT use the MAPPER2 facility to determine the I/O paths for the disk array. MAPPER2 will not be able to recognize and report the LUNs of the disk array on the Fibre Channel switch.
- You must use web browser access via LAN to the Fibre Channel switch to determine the I/O path to use for the primary boot path.

The remainder of this appendix gives more detailed procedures, illustrated with actual examples, for these three methods of determining the primary boot path and loading the OS software onto a native Fibre Channel connected disk array.

Existing MPE/iX 7.5 boot disk is available

If an existing MPE/iX boot disk is available, simply boot and start the system from the existing boot disk in normal fashion.

When the system is up, run the **fcscan -h** command to find and display the I/O paths for the newly connected disk array devices.

NOTE: Before you can run **fcscan** to find the paths for the disk array devices, you must configure the native Fibre Channel HBAs used to connect the disk arrays to the MPE/iX I/O system configuration. The **fcscan** command depends on finding the Fibre Channel HBAs in the existing system configuration in order to perform its search for attached disk array devices.

Follow this procedure if you have an existing boot disk:

1. Boot and start the existing system normally from the existing boot disk.

```
Main Menu: Enter command or menu > bo pri
Interact with IPL (Y, N, or Cancel)?> y

Booting...
Boot IO Dependent Code (IODC) revision 1

SOFT Booted.
MMSAVE Version 2.8
DUMPAREA found, save main memory to disc
ISL loaded

ISL Revision A.00.43  Apr 12, 2000

ISL> start norecovery group=config
MPE/iX launch facility

Scanning PCI BUS 0    +**.**+.....
Scanning PCI BUS 10   +.....
Scanning PCI BUS 20   +.....
Scanning PCI BUS 30   +.*.....
Initialize_genesis - Ver bld1: <<pci 2.1601>>
THU, JUL 29, 2004, 10:39:49 AM (y/n)?

Initialize_genesis = Ready to configure I/O
[CDM] 03 07 02 12
Initialize genesis completed.
Create Console Messages kso completed.
... ..
```

2. Run IOCONFIG to add the new Fibre Channel HBAs to the existing system's I/O configuration (or run SYSGEN if you prefer, but that will require a system reboot after the configuration has been modified). You should have recorded the I/O paths for the HBAs when the HBAs were installed. In this example, the A6795A Fibre Channel HBA was installed at I/O path 0/6/0/0.

```
CSYLE18<PUB.SYS>:ioconfig
IOCONFIG A.00.00 (catalog A.00.00) (c) 1994 Hewlett-Packard Co. All Rights Reserved
ioconfig:ap path=0/6/0/ id=pci_device
ioconfig:ap path=0/6/0/0; id=a6795a
td: claimed Tachyon XL2 Fibre Channel Mass Storage card at 0/6/0/0
Scanning for fibre channel devices at 0/6/0/0. This may take a while...
ioconfig: ex
    keeping to group CONFIG.SYS
    Purge old configuration (yes/no)?Automatic yes
    ** configuration files successfully saved **
CSYLE18<PUB.SYS>:
```

3. Run the **fcscan -h** utility to obtain the I/O paths for the disk array N-ports and LUNs.

```
CSYLE18<PUB.SYS>:fcscan -h

FCSCAN Version 1.1

Scanning for Fibre Channel devices.
This could take upto few minutes. Please wait ...

FCSCAN has found the following Fibre Channel I/O Adapter Cards and Devices
on this system.
```

SYSGEN PATH	DESCRIPTION	BOOT MENU PATH
=====	=====	=====
0/6/0/0	Fibre Channel Adapter	
0/6/0/0.102	Fibre Channel N-Port	
0/6/0/0.102.0	HP OPEN-3 disk	0/6/0/0.8.0.102.0.0.0
0/6/0/0.102.1	HP OPEN-3 disk	0/6/0/0.8.0.102.0.0.1
0/6/0/0.102.2	HP OPEN-3 disk	0/6/0/0.8.0.102.0.0.2
0/6/0/0.102.3	HP OPEN-3 disk	0/6/0/0.8.0.102.0.0.3
... ..		

```
CSYLE18<PUB.SYS>:
```

4. Choose the disk array LUN that you will use as the new MPE/iX Ldev 1 and note the BOOT MENU PATH I/O path for that disk in the **fcscan** output listing. That path will become the system's primary boot path. For this example, LUN 2 on the disk array was used at BOOT MENU PATH 0/6/0/0.8.0.102.0.0.2

5. Shut down the running system and reset (or TC) the computer.

```
CSYLE18<PUB.SYS>: shutdown system
SESSION aborted by system management. (CIERR 6027)
CPU=2. Connect=60. TUE, AUG 24, 2004, 3:53 PM.
15:53/#S2/46/LOGOFF ON LDEV #20.
Spoolers notified of a shutdown. (Shut 16)
15:53/47/The Spooling system has been shutdown.
Shutdown of system processes begins. (Shut 4)
Shutdown of system managers begins. (Shut 5)
Shutdown of operating system complete. (Shut 6)
```

6. Set the system's primary boot path to the BOOT MENU PATH you noted in step 4 above.

```
Main Menu: Enter command or menu > pa pri 0/6/0/0.8.0.102.0.0.2

Primary boot path:      0/6/0/0.8.0.102.0.0.2
                       0/6/0/0.8.0.66.0.0.2(hex)
```

7. You can now install the OS from the SLT (System Load Tape) on the alternate boot path onto the disk array device on the primary boot path.

```
Primary boot path:      0/6/0/0.8.0.102.0.0.2
Alternate boot path:    0/0/2/0.6
Console path:          0/0/4/0.0
Keyboard path:         0/0/4/0.0
```

```
Main Menu: Enter command or menu > bo alt
Interact with IPL (Y, N, or Cancel)?> y
```

```
Booting...
Boot IO Dependent Code (IODC) revision 1
```

```
SOFT Booted.
TAPEIPL Version 1.0
ISL loaded
```

```
ISL Revision A.00.43 Apr 12, 2000
```

```
ISL> install
.....
```

8. When you are finished loading the OS software, return to the main body of this document at “Configure the disk array devices in MPE/iX” ([page 28](#)).

No existing MPE/iX boot disk available and disk array is direct Fibre Channel connected

If you have no boot disk available and the disk array is direct Fibre Channel connected, you can use the MAPPER2 utility while the system is booted from the SLT tape on the alternate boot path. MAPPER2 will locate and display the boot menu I/O paths for the directly Fibre Channel attached disk arrays. You choose the desired disk array LUN from the MAPPER2 output to become the new MPE/iX Ldev 1 boot disk, and then use the MAPPER2 I/O path to set the system's primary boot path for loading the OS.

Follow this procedure and example to use MAPPER2 to set the boot path:

For brevity, only an excerpt of the MAPPER2 output is shown.

1. Boot the system from the SLT tape on the alternate boot path.

```
Main Menu: Enter command or menu > bo alt
Interact with IPL (Y, N, or Cancel)?> y
```

```
Booting...
Boot IO Dependent Code (IODC) revision 1
```

```
SOFT Booted.
TAPEIPL Version 1.0
ISL loaded
```

```
ISL Revision A.00.43  Apr 12, 2000
```

```
ISL>
```

2. Invoke the ODE environment and run the MAPPER2 utility.

```
ISL> ode
... ..
ODE> run mapper2
```

3. Choose the desired disk array LUN as the new boot disk and record its I/O path from MAPPER2. In the following example, LUN 2 of the disk array is used at path 0/6/0/0.8.0.102.0.0.2.

STARTING EXECUTION OF MAPPER2

Processor Identification:
 Hardware Model: 5CBH, Revision: 0
 Software Model: 4H, Revision: 0

... ..
 I/O Configuration:

Path	Component Name	ID	Type	HW	SW	Revisions	
			Model	Model	Hdwr	Firm	
0	Astro BC Runway Port	CH	582H	BH	0	0	
0/0	Elroy PCI Bridge	DH	782H	AH	0	0	
0/0/0/0	Ethernet Controller	1011H	0019H	103CH	104FH	41H	
... ..							
0/6/0/0	HP 6795A 2G/1G Fibre Chan. Adapter	103CH	1029H	103CH	128CH	0BH	
0/6/0/0.8.0.102.0.0.0	HP OPEN-3	-	-	-	-	0118	
0/6/0/0.8.0.102.0.0.1	HP OPEN-3	-	-	-	-	0118	
0/6/0/0.8.0.102.0.0.2	HP OPEN-3	-	-	-	-	0118	
0/6/0/0.8.0.102.0.0.3	HP OPEN-3	-	-	-	-	0118	

- Exit the ODE environment back to the ISL> prompt, and set the desired primary boot path.

```
ODE> exit
ISL> primpath 0/6/0/0.8.0.102.0.0.2
```

- Now INSTALL the OS software from the SLT on the alternate boot path to the selected disk array device on the primary boot path.

```
ISL> install
... ..
```

- When finished loading the OS software, return to the main body of this document at “Configure the disk array devices in MPE/iX” ([page 28](#)).

No existing MPE/iX boot disk available and disk array is Fibre Channel switch connected

If you have no boot disk and the array is connected to a Fibre Channel switch, the MAPPER2 utility CANNOT be used to determine the I/O paths for the disk array devices. Instead, you need to derive the primary boot path information from the known I/O path of the A6795A Fibre Channel HBA (recorded at hardware installation time) and the known configuration of LUNs within the disk array (established earlier with Command View XP or LUN Configuration Manager). Additional path information must be obtained by LAN connection of a suitable web browser to the Fibre Channel switch.

Primary boot path format for Fibre Channel devices

In order to form the desired primary I/O boot path for the disk array to be used as Ldev 1, you will be combining three parts of the I/O path to make the whole I/O path in the format required by processor PDC for boot paths:

- The part of the I/O path that belongs to the A6795A Fibre Channel HBA, plus
- The part of the I/O path that belongs to the disk array's Fibre Channel interface (the N-Port), plus
- The part of the I/O path that gives the SCSI target ID and LUN information for a LUN within the disk array.

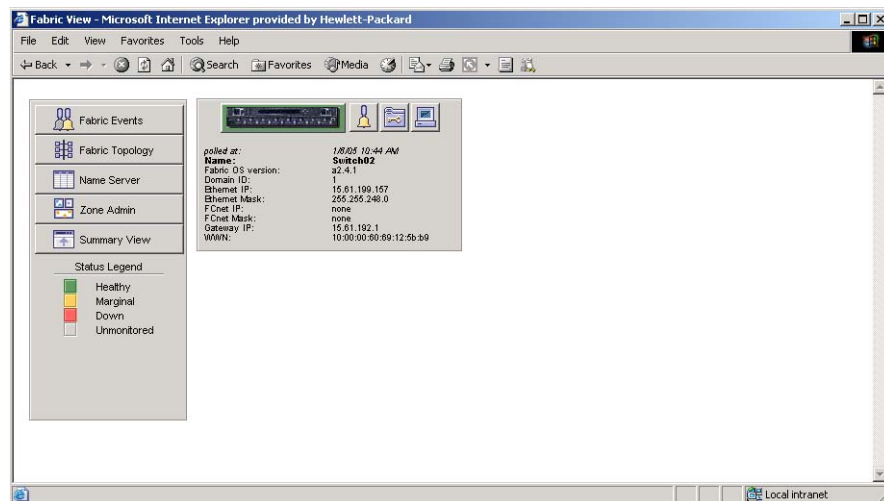
PDC on A-Class and N-Class systems requires the following format for combining these I/O path parts:

```
|-- HBA I/O Path Part --|--- FC N-Port I/O Path Part---| SCSE LUN I/O Path Part-|  
BC / BC / BC / Card . Domain . Area . Port . Bus# . Target ID . LUN  
0 / 6 / 0 / 0 . 1 . 20 . 44 . 1 . 3 . 0
```

You should already know the HBA I/O path, recorded when the HBA hardware was installed and also the SCSI LUN I/O path. The following section explains how to use a web browser to determine the FC N-Port I/O path needed to complete the whole primary boot path.

Determining the FC N-Port I/O path

Using a web browser, navigate to the address of your Fibre Channel switch, where you will see a display similar to the one below. Details may differ depending on switch model and firmware level. Look for the “Name Server” control button. In the example below, it is the third button down from the top on the left side of the display.



Click on the **Name Server** button to access the Name Server display, and the switch will present a display a name server table similar to the one that follows:

Domain #	Port #	Port ID	Port Type	Port WWN	Node WWN	Symbolic Name	F
1	0	011001	NL	29.00.00.60.22.00.3f.df	28.00.00.60.22.00.3f.df	NULL	F
1	1	011100	N	50.06.0b.00.00.13.19.4c	50.06.0b.00.00.13.19.4d	NULL	F
1	2	011201	NL	29.00.00.60.22.00.3d.fb	28.00.00.60.22.00.3d.fb	NULL	F
1	3	011300	N	50.06.0b.00.00.13.19.5a	50.06.0b.00.00.13.19.5b	NULL	F
1	4	011400	N	50.06.0b.00.00.10.bd.38	50.06.0b.00.00.10.bd.39	NULL	F
1	5	011532	NL	50.06.0b.00.00.12.0d.1a	50.06.0b.00.00.08.ab.4e	[28]HP A6188A HP19"	F
1	7	011700	N	50.06.0b.00.00.10.bd.62	50.06.0b.00.00.10.bd.63	NULL	F

You should already know the port number of the plug-in port on the Fibre Channel switch where you have connected the disk array. If you need to, trace the Fibre Channel cable from the disk array to the switch and determine the port to which the array is connected. In the example figure above, the disk array is connected to ports 5 of the switch. You will notice the disk model information in the “Symbolic Name” portion of the Name Server display, at the right on the line for Port # 5.

The **Port ID** column of the display has the information needed to form the FC N-Port part of the I/O path. The Port ID is a 6-character hexadecimal digit (3 bytes) that decomposes into the three portions (Domain.Area.Port) of the FC N-Port part of the I/O path. Since PDC boot paths are set as decimal numbers, these three portions of FC N-Port value have to be converted from hex to decimal before you can use them to set the primary boot path.

Example for Port #5, Port ID 011532

In the Name Server display above, the disk array on Port 5 has Port ID = 011532, hexadecimal. To convert this to the FC N-Port format required by PDC, break apart the 6 digit hex number into its 3 hex bytes, and convert

each hex byte to its decimal equivalent. The resulting three decimal numbers become the FC N-Port (Domain.Area.Port) portion of the primary boot path:

- 011532 hex → 01 15 32
- 01 hex → 01 decimal
- 15 hex → 21 decimal
- 32 hex → 50 decimal

so the FC N-Port portion of the I/O path is **1.21.50**.

Composing the entire primary I/O boot path

You can now form the entire primary I/O boot path for PDC by combining:

- the HBA part of the path, 0/6/0/0
- the FC N-Port part of the path, 1.21.50
- your selected SCSI LUN within the disk array, for this example: 0.0.2 (bus.target.lun)

to get the complete primary I/O boot path **0/6/0/0.1.21.50.0.0.2**.

Now set the system's primary boot path to that value, and then install the OS from the SLT tape.

When you are finished loading the OS, return to the main body of this manual at the "Configure the disk array devices in MPE/iX" ([page 28](#)).

Glossary

AL	Arbitrated loop.
AL-PA	Arbitrated loop physical address.
BC	HP StorageWorks Business Copy XP. BC lets you maintain up to nine local copies of logical volumes on the disk array.
CA	HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of local logical volumes on a remote disk array.
Command View	HP StorageWorks Command View XP, a software product for managing XP arrays. Command View runs on a Windows-based management workstation. Required for RAID Manager but not to be used as a volume containing any MPE/iX data.
command device	An LDEV that transfers RAID Manager commands to BC or CA logical volumes.
CVS	CVS devices (OPEN-x CVS) are custom volumes that are smaller than normal fixed-sized logical disk devices (volumes).
DKC (disk controller unit)	The array cabinet that houses the channel adapters and service processor (SVP).
DKU (disk cabinet unit)	The array cabinets that house the disk array physical disks.
emulation modes	Emulation modes can be assigned to LDEVs to make them operate like standard OPEN system disk drives. The emulation mode of an LDEV determines its capacity. Refer to the appendices for device capacities.

FC	Fibre Channel.
FC-AL	Fibre Channel arbitrated loop.
FCP	Fibre Channel Protocol.
HBA	Host bus adapter.
HP	Hewlett-Packard Company.
Ldev	As it relates to MPE/iX, Ldev refers to an MPE logical device synonymous with an MPE volume member, MPE device or LUN created under the control of MPE/iX's SYSGEN utility program.
LDEV	Logical device. An LDEV is created when a RAID group is divided into sections using a selected host emulation mode (for example, OPEN-9 or OPEN-M). The number of resulting LDEVs depends on the emulation mode. "LDEV" and "volume" are synonyms.
LUN	Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.
LUSE	Logical Unit Size Expansion, a feature which logically combines LDEVs so they appear as a larger LDEV. This allows a LUN to be associated with 2 to 36 LDEVs. LUSE allows applications to access data requiring large amounts of disk space.
OFC	Open Fibre Control.
OPEN-x	A general term describing any one of the supported OPEN emulation modes (for example, OPEN-L).
OS	Operating system.
path	"Path" and "LUN" are synonymous. Paths are created by associating a port, a target, and a LUN ID with one or more LDEVs.

port	A connector on a channel adapter card in the disk array. A port passes data between the disk array and external devices, such as a host server. Ports are named using a port group and port letter, for example, CL1-A.
RAID	Redundant array of independent disks.
remote console PC	The PC running HP StorageWorks Remote Control XP.
Remote Control (RC)	HP StorageWorks Remote Control XP. A software product used for managing XP arrays.
R-SIM	Remote service information message.
SCSI	Small computer system interface.
SIM	Service information message.
SNMP	Simple Network Management Protocol.
SVP	Service processor. A notebook computer built into the disk array. The SVP provides a direct interface to the disk array and is used only by the HP service representative.
TID	Target ID.
VSC	Volume Size Configuration is a feature that defines custom volumes (CVS volumes) that are smaller than normal fixed-sized logical disk devices (volumes).
WWN	World Wide Name. A unique identifier assigned to a Fibre Channel device.

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